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System for the neutralization and detoxification of chemically polluted wastewater and/or the decontamination of radioactive wastewater

The invention concerns the purification of wastewater, especially a system for the neutralization and detoxification of chemically polluted wastewater and/or the decontamination of radioactive wastewater with equipment for mixing the wastewater with chemicals and/or dilution water before the wastewater is released into the sewer.

Systems for the neutralization and detoxification of chemically polluted wastewater generally have a neutralization basin into which the wastewater is routed. A mixer-settler is immersed in the basin and stirs up the wastewater contained therein and thoroughly mixes it with the chemicals added for neutralization and detoxification. The neutralized and detoxified wastewater is then released from this neutralization basin into the sewer.

Systems for the decontamination of radioactive wastewater are also equipped with a mixing apparatus that is immersed in a large container and sets the wastewater contained therein in motion.

Such systems occupy a considerable amount of space, require large volumes to be set in motion, and therefore take relatively long periods of time to mix the materials that are to be combined with each other. In addition, a relatively large amount of energy must be expended.

The task of the invention is to reduce the dimensions of the systems substantially and/or to simplify their design substantially, so that the process of mixing can be carried out in the shortest possible time with the least possible additional energy.

This underlying task of the invention is accomplished by configuring the mixing apparatus as a static mixing trajectory with incorporated structures resembling baffles to stir up the liquid, into which the wastewater is fed under pressure.

If the system is utilized for the neutralization and detoxification of chemically polluted wastewater, for example, it is characterized by having the wastewater carried by a pipeline with built-in baffles, into which devices designed to dispense chemical additives open at the point where the wastewater enters. What was previously for the most part a static system is thus transformed into a somewhat dynamic system, while the blending and preparation of the wastewater simultaneously occurs in the turbulent trajectory by adding the appropriate chemicals.

The preferred method is to provide a testing device that registers the treatment status of the wastewater at the outlet end of the pipeline, whereby the testing device controls the valves located in the feed input devices.

If, by way of example, the system is used for the decontamination of radioactive wastewater with at least one collecting tank, equipment for circulating and mixing the tank contents, and a device for adding water to dilute the wastewater leaving the tanks, it is

characterized according to the invention by the fact that there is a static mixing trajectory incorporated in the tank outlet pipeline equipped with a conveyance device, that can be connected at will to a pipeline that flows back to the tanks or to a pipeline that leads to the sewer.

In a further embodiment of the invention, an additional mixing trajectory can be incorporated into the pipeline that leads to the sewer, upstream of which the incoming dilution water enters.

In the following, the invention is explained in greater detail with reference to embodiment examples.

The drawings show:

In Fig. 1 A system for the neutralization and detoxification of chemically polluted wastewater according to the invention;

In Fig. 2 A system for the decontamination of radioactive wastewater according to the invention; and

In Fig. 3 An embodiment example for a static mixing trajectory.

The embodiment in Fig. 1 shows there is a mixing pipe 1 with built-in elements 2 resembling baffles. At the left, the water that is to be purified enters in the direction indicated by the arrow. The chemicals needed in order for neutralization and detoxification are added to it by way of the containers 4 holding the chemicals and the magnetic valves 5. The number 3 indicates a pH input electrode and 7 signifies a pH outlet electrode, whose signals are relayed to the control console that governs the two magnetic valves 5 that are responsible for adding a sufficient quantity of the chemicals needed for neutralization, detoxification, and precipitation.

Said chemicals can be liquids, solids, or gases.

In the system according to Fig. 2, the aim is to decontaminate radioactive wastewater that has been collected in the tanks 11 and 12. Normally, mixing devices are found in these tanks in addition to pumps, all of which create a considerable demand for energy. According to the invention, thorough mixing is accomplished with the aid of the static mixing trajectory 13, which is also embodied as a pipe with built-in elements resembling baffles. The water is conveyed by pumps 14 and 15, with suitable closing mechanisms provided, such as, for example, the valves 16, 17, 18, 19, 20, and 21, allowing for proper control of the circulation and release of wastewater.

The wastewater mixed in the apparatus 13 then proceeds through the open valve 22 to another mixing trajectory 23, before which is a pipeline 24 through which dilution water enters, whereby the dilution water need not be fed in through the pipeline 24 as shown in the drawing, i.e. parallel to the active water, but can, for example, alternatively be accomplished by jet-spraying into the pipeline that conveys the active water. At 25, a device for removing samples is indicated, while 26 represents a measuring counter arranged behind a valve 27, with the pipeline 28 coming from a fresh water source, by way of a pump, for example, or a system for increasing pressure.

The turbulence in the two structural elements 13 and 23 is created by static means, i.e. they contain no moving parts. It can be readily seen that the system according to Fig. 2 is much simpler in design than known systems.

Fig. 3 shows a schematic diagram of an embodiment example of a static mixing trajectory. We see here a so-called KENICS-Static Mixer as described, for example, in "Grease-Soap-Painted Coatings," or "Fette-Seifen-Anstreichmittel" in Die Ernährungsindustrie 74, 449-453 (1972), published by the Industrieverlag von Hernhaussen KG in Hamburg 11 [Germany].

Patent claims:

Patent Claims:

1. A system for the neutralization and detoxification of chemically polluted wastewater and/or the decontamination of radioactive wastewater, having equipment for mixing the wastewater with chemicals and/or dilution water prior to releasing the wastewater into the sewer, **characterized by the fact that** the mixing apparatus consists of a static mixing trajectory with incorporated elements resembling baffles to create turbulence in the liquid, which is fed in under pressure.
2. A system according to claim 1 for the neutralization and detoxification of chemically polluted wastewater, characterized by a pipeline provided with incorporated baffles to carry the wastewater, with feed input devices for adding chemicals opening into the pipeline at the point where the wastewater enters.
3. A system according to claim 2, characterized by the fact that there is a testing device registering the treatment status of the wastewater at the output end of the pipeline that controls valves located in the chemical input feeding devices.
4. A system according to claim 1 for the decontamination of radioactive wastewater having at least one collecting tank, equipment for circulating and thorough mixing of the tank contents, and a device for adding dilution water to the wastewater drawn out of the tanks, characterized by the fact that there is, incorporated in the pipelines that put water into the tanks or take it out of them, an incorporated static mixing trajectory that can be connected at will to a pipeline flowing back to or leading into the tanks and the pipeline that leads to the sewer.
5. A system according to claim 4, characterized by the fact that an additional static mixing trajectory is incorporated in the pipeline leading to the sewer, upstream of which or into which the pipeline through which dilution water is introduced opens.

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Fig. 1

Einlauf = Input
Auslauf = Output

Fig. 2

Kanal = Sewer